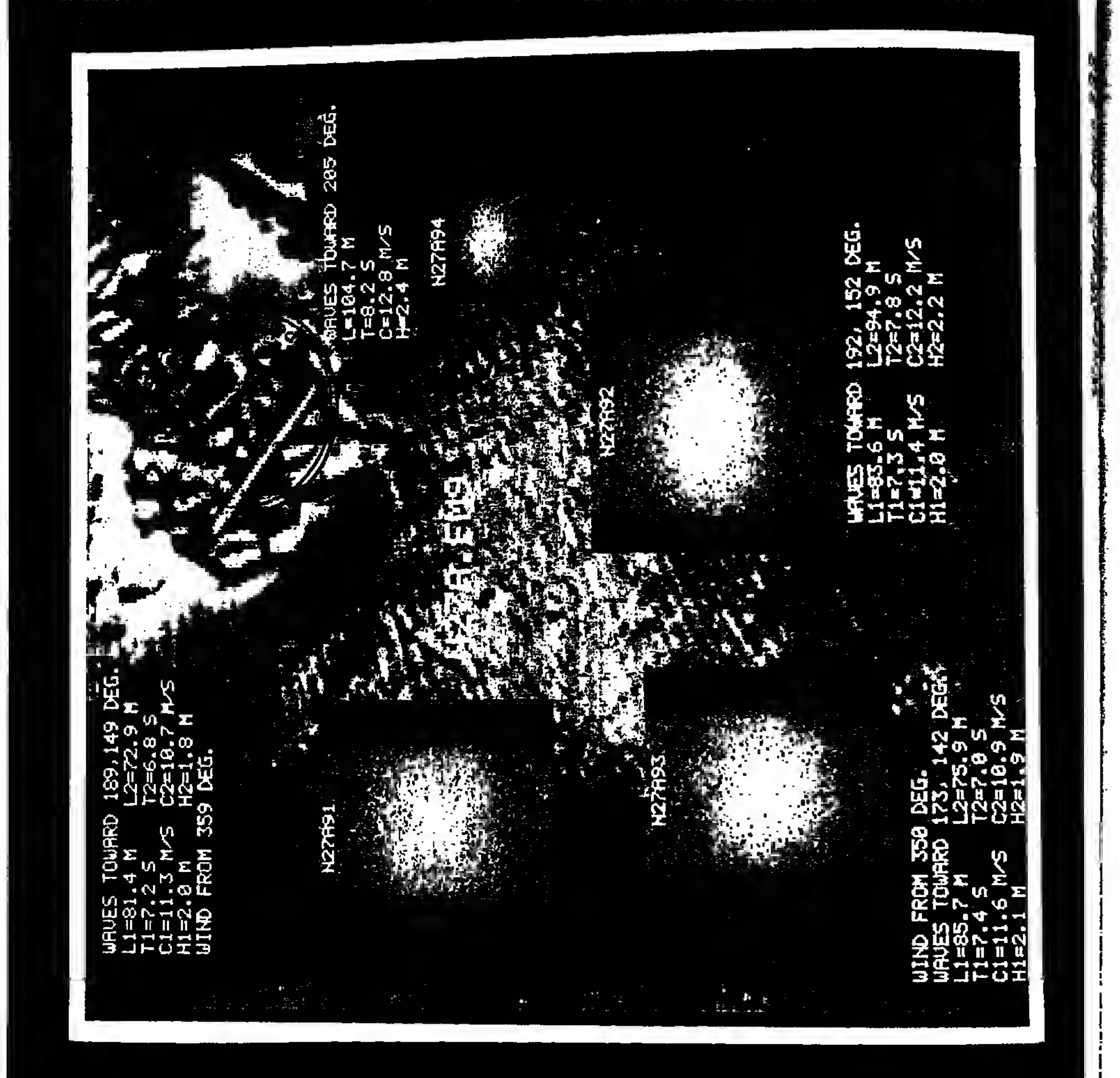

News

Priorities for Solar and Space Physics

The Space Science Board's Committee on Solar and Space Physics is presently preparing a report for NASA on the priorities for new space science programs in solar and space physics, much as the Astronomy Survey (NAS-Field Report) and Solar-System Exploration Committees (NASA-SSEC Report) did for their respective disciplines.

This National Academy report is intended to define a program of space missions and associated ground-based activities that NASA should undertake from now through the 1990's that will make substantial advances in our understanding of the physics of the sun and heliosphere, space plasmas, magnetospheres of the earth and other planets, and the ionosphere and upper atmosphere of the earth.

The study will build upon previous reports and studies as well as input from the community. Those wishing to offer suggestions, potential experiments, or advice should contact the Committee Chairman, S. M. Krimigis (Applied Physics Laboratory), or one of the discipline working group leaders: Solar and Heliospheric Physics, C. Withbroe (Center for Astrophysics); Space Physics, R. Fredericks (TRW); Atmospheric Science, D. Strobel (Naval Research Laboratory). The Executive Secretary for the Committee is R. C. Hart, NAS.

The report is expected to be completed by fall 1984.

This news item was contributed by S. M. Krimigis of the Johns Hopkins University Applied Physics Laboratory in Laurel, Md.

Yamato 791197

A second meteorite of probable lunar origin has been found among the several thousand meteorites recovered from Antarctica. It is number 791197 from the Yamato collection, which was recovered by an expedition from the Japanese Institute of Polar Research, Tokyo. The first meteorite of probable lunar origin (ALHA 81005) was identified by Brian Mason in 1982.

Some meteorites may be leftover rock fragments from the nucleo-synthesis event that produced the solar system. It is also believed that some meteorites are the result of other meteorite impacts on either the moon or on Mars and that these samples were ejected into earth orbit. However, it is not clear if these samples could have escaped the gravity on Mars.

Yamato 791197 is a 25.4 gm specimen that was described recently by K. Yanai and H. Kojima at the Ninth Symposium on Antarctic Meteorites, held March 22–24, 1984, in Tokyo. The surface of the meteorite is encrusted with glassy fused rock material, which apparently is evidence of heating during its passage through the earth's atmosphere. Like ALHA 81005, this meteorite is classified as an impact breccia of anorthositic character. The chemical composition carries definite evidence of its being from the moon. Yamato 791197 is specifically different from other generally similar meteorite groups such as eucrites and howardites.

The ratio of MnO to FeO is a characteristic fingerprint of lunar material. Olivines and pyroxenes from the Yamato sample fall within the appropriate lunar range (approximately 1/70).—*PMB*

U.S. Wetlands

Although the overall rate that the nation's wetlands are being converted to other uses is not alarming, the continued incremental conversion of wetlands, especially in certain inland regions of the country, may have significant adverse ecological effects over the next few decades. A comprehensive report on wetlands, requested by the Senate Committee on Environment and Public Works, was released recently by Senator John H. Chafee (R-R.I.), chairman of the Subcommittee on Environmental Pollution. The report outlines options for new federal measures that could lead to more effective management of wetlands in the United States.

Federal efforts to manage wetlands could be more effective if they were focused on higher value wetlands, although, because the value of individual wetlands in different regions of the country have not been evaluated at this time, priorities for protection have not been established.

The Office of Technology Assessment (OTA) has called for the federal government to continue or accelerate its ongoing mapping of wetlands, concentrating on areas under the greatest development pressure. The next step, OTA says, involves categorizing wetlands according to their relative values by policymakers in cooperation with regional groups. In this way, existing wetland programs can be more effectively focused on higher value wetlands. OTA suggests that Congress could also broaden the scope of existing wetland programs so that all of the natural values of wetlands are considered in managing the various leasing, regulatory, and acquisition programs. At present, decisions about wetlands use are most often based on single values, such as wildlife habitat.

The U.S. Army Corps of Engineers' regulatory program, established by section 404 of the Clean Water Act, provides the major avenue of federal involvement in controlling wetland use by regulating discharges of dredged or fill material into wetlands. For Corps-regulated activities, annual conversions of wetlands were reduced by about 50,000 acres per year, or 50% of the acreage applied for.

Conversions of inland, freshwater wetlands for agricultural purposes have been responsible for 80% of the wetland losses over the last 3 decades. Since the Corps' 404 program generally does not regulate these activities, 95% of the nation's wetlands, which are located in inland areas, are not well protected by regulatory programs. OTA notes that most coastal wetlands are reasonably well protected by a combination of section 404 and state regulatory programs.

There are about 90 million acres of vegetated wetlands remaining in the lower 48 states, with an additional 200 million acres classified as wetlands in Alaska. Between the mid-1950's and the mid-1970's, the annual rate of conversion in the lower 48 states was about 550,000 acres a year. Because rates of agricultural drainage have declined, OTA estimates that annual conversions are now about 300,000 acres.—*PMB*

NSF Graduate Fellowships

Of the 540 college students offered fellowships by the National Science Foundation (NSF) this year for graduate study in 1984–1985 in the natural and social sciences, mathematics, and engineering, 34 plan to pursue graduate studies in the earth, ocean, or space sciences. In addition, of the 60 NSF Minority Graduate Fellowships awarded this year, 2 were offered to students who plan graduate studies in the earth, ocean, and space sciences.

Each fellowship, awarded for 3 years of graduate study, provides a stipend of $8,100 per year for full-time graduate study. An annual cost-of-education allowance of $4,900 is provided by NSF in lieu of all tuition and fees to the institution selected by each fellow for graduate study. The fellowships may be used over 5 years to permit students to incorporate teaching or research assistantships into their education during periods in which they are not receiving their fellowship stipends.

In addition to the NSF Graduate Fellowship awards offered this year, 974 individuals who received fellowship awards in previous years are eligible to continue their study during the 1984–1985 fellowship year.

Those students who were offered graduate fellowship awards this year to pursue graduate studies in earth, ocean, or space sciences are listed below with their proposed fields of study and the institutions chosen for graduate study.

Geoffrey Alexander Abers, geophysics, California Institute of Technology (CalTech); Janet Maria Becker, oceanography, University of California, San Diego; Paul Arthur Berkman, biological oceanography, University of Rhode Island; Sara Cooper Brothers, geology, University of New Mexico; Carol Jacqueline Bryan, geophysics, University of California, Berkeley; Kelley Elaine Carlson, geophysics, University of Minnesota, Minneapolis; William Ward Chadwick, Jr., geology, University of California, Santa Barbara; Steven Cregory Crews, geology, Colorado State University; Rebecca Jones Dorsey, geology, Cornell University; Mark Allen Fahnestock, geology, CalTech; Steven Scot Fine, meteorology, Pennsylvania State University; Tanya Helen Furman, geology, Massachusetts Institute of Technology (MIT); John Patrick Clitner, geology, University of Texas, Austin; Robert Earl Crimm, Jr., geophysics, MIT; Kristine Holderied, biological oceanography, University of California, San Diego.

Samuel Warren Joffe, geophysics, Stanford University; Thomas Charles Juster, geology, University of Michigan; Meghan Willis Keith, geology, MIT; Michael Maier Keller, geochemistry, Princeton University; Kelly Lynn Kenison, oceanography, MIT; Walter Scott Kiefer, geology, CalTech; Bradley Stewart Meyer, astronomy, University of Illinois, Chicago; Stephen David Murray, astronomy, University of California, Santa Cruz; Jacqueline C. Mutschler, geophysics, Cornell University; Jon Michael Nese, meteorology, Pennsylvania State University; Kirsten Peters, geology, Harvard University; Cynthia C. Pioтрowski [sic] Reilly, geochemistry, Pennsylvania State University; Michael Perry Rupen, astronomy, CalTech; Daniel Badger Seaver, geology, University of California, Santa Barbara; Jonathan Edward Snow, geochemistry, University of Rochester; Michael Abram Strauss, astronomy, Princeton University; Mark Ira Tecotzky, geochemistry, MIT; and Rebecca Anne Williams, geology, Johns Hopkins University.

The minority fellowships are awarded to minority students of outstanding ability. More than 520 students who are American Indian, Black, Pacific Islander, or Hispanic submitted applications to the nationwide competition. Ernest Austin Benson, Jr., will study geology at Harvard University. Lisa Diane White will study geology at Stanford University. In addition to the NSF Minority Graduate Fellowship awards offered this year, 106 individuals who received fellowship awards in previous years are eligible to continue their study during the 1984–1985 fellowship year.—*BTR*

In Congress: Upcoming Hearings

The following hearings and markups have tentatively been scheduled for the coming weeks by the Senate and House of Representatives. Dates and times should be verified with the committee or subcommittee holding the hearing or markup; all offices on Capitol Hill may be reached by telephoning 202-224-3121. For guidelines on contacting a member of Congress, see *AGU's Guide to Legislative Information and Contacts* (*Eos*, April 17, 1984, p. 159).

May 8: Mark up of Landsat commercialization bill (S. 2292) by the Senate Commerce, Science, and Transportation Committee. Russell Building, Room SR-253, 9:30 A.M. The House of Representatives passed its version of the Landsat commercialization bill (H.R. 5155) (*Eos*, April 17, 1984, p. 149) on April 9.

May 10: U.S. Geological Survey appropriations hearing for fiscal 1985 by the Interior and Related Agencies Subcommittee of the Senate Appropriations Committee. Dirksen Building, Room SD-138, 10 A.M.—*BTR*

Smithsonian Grants

The Smithsonian Institution has announced the deadlines for a fellowship in residence program and a foreign currency grants program.

The residence fellowships support independent research and study in fields that are actively pursued by the various bureaus of the institution. The primary objective of the fellowships is to further the research training of scholars and scientists in the early stages of their professional careers. Proposals will be considered for research, among other topics, in earth sciences; paleobiology; ecological, behavioral, and environmental studies of tropical and temperate zones; and history of science and technology.

Individuals are selected competitively and are appointed to work under the guidance of professional staff members and to use the Smithsonian's collections and facilities. Predoctoral and post-doctoral appointments have a 6- to 12-month tenure; graduate student appointments are for 10 weeks.

Stipends supporting awards are $18,000 per year plus allowances for postdoctoral fellows; $11,000 per year plus allowances for predoctoral fellows; and $2,000 for graduate students for the 10-week appointment.

Individuals interested in astrophysics or geophysical research should write to the Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138. For general information and for information on other fellowships fields, contact the Smithsonian Institution Office of Fellowships and Grants, L'Enfant Plaza, Suite 3300, Washington, DC 20560 (telephone: 202-287-3271 or 202-287-3321). The application deadline is January 15, 1985.

The Smithsonian Foreign Currency Program, a national research grants program, offers opportunities for support of research in Burma, New Guinea, India, and Pakistan in astrophysics, earth sciences, anthropology, archeology and related disciplines, systematic and environmental biology, and museum programs.

Awards are determined based on competitive scholarly review. Grants in the local currencies of the country where the research will be performed are awarded to American institutions for the research of senior scientists. Collaborative programs involving host country institutions are welcome.

For additional information, write to the Foreign Currency Program, Office of Fellowships and Grants, Smithsonian Institution, Washington, DC 20560 (telephone: 202-287-3321). The deadline is November 1, 1984.

Geophysicists

Philip H. Abelson, editor of *Science*, and ***Rep. Edward Boland***, ranking member of the House Appropriations Committee and chairman of its Subcommittee on HUD and Independent Agencies, will receive the Distinguished Public Service Award of the National Science Foundation (NSF) at a dinner sponsored by the National Science Board on May 9. Abelson and Boland will be honored at a reception on May 8 as part of the NSF-sponsored Science Week. Abelson has held numerous positions at the University of California at Berkeley, the Naval Research Laboratory, and the Carnegie Institution, which he headed as president from 1971 to 1978. He has been editor of the American Association for the Advancement of Science's weekly journal since 1962. Boland is a strong supporter of fundamental research, science and mathematics education, and space sciences.

Barbara Fillmore has been selected to receive the Association for Women Geoscientists' National Officers Scholarship Award, which is presented to the outstanding woman geoscientist working in a degree program who has been an active participant in her profession and community. Fillmore is currently completing a masters of science degree in geology at the Colorado School of Mines.

Don Kirkham, a former professor of soil chemistry at Iowa State University, has been awarded the Wolf Prize for 1983–1984 from the Israeli-based Wolf Foundation. The $100,000 prize, which he is sharing with agronomist ***Cornelis T. de Wit*** of Holland, is believed to be the largest prize for agricultural research.

Ivan I. Mueller, has been appointed the chairman of the department of geodetic sciences and surveying at The Ohio State University from October 1, 1984, though September 30, 1988. Mueller was elected first vice president of the International Association of Geodesy at the 1983 General Assembly of the International Union of Geodesy and Geophysics.

In Memoriam

The following AGU members are recently deceased.

Richard H. Jahns, 68, died December 31, 1983. An AGU Fellow and a member of the Volcanology, Geochemistry, and Petrology section, he joined AGU in 1945.

Sadami Matsushita, 64, died March 14, 1984. A member of the Solar-Planetary Relationships section, he joined AGU in 1955.

Kiyotoshi Mizawa, 45, died February 16, 1984. A member of the Solar-Planetary Relationships section, he joined AGU in 1969.

Rocco S. Narcisi, 53, died March 27, 1984. A member of the Solar-Planetary Relationships section, he joined AGU in 1969.

Duane C. Simpson, 36, died January 19, 1984. A member of the Ocean Sciences section, he joined AGU in 1972.

Geophysical Events

This is a summary of *SEAN Bulletin*, 9(3), March 31, 1984, a publication of the Smithsonian Institution's Scientific Event Alert Network. The complete bulletin is available in the microfiche edition of *Eos* as a microfiche supplement or as a paper reprint. For the microfiche, order document E84-004 at $2.50 (U.S.) from AGU Fulfillment, 2000 Florida Avenue, N.W., Washington, DC 20009. For the paper reprint, order *SEAN Bulletin* (giving volume and issue numbers and issue date) through AGU Separates at the above address; the price is $3.50 for one copy of each issue number for those who do not have a deposit account, $2 for those who do; additional copies of each issue number are $1. Subscriptions to *SEAN Bulletin* are available from AGU Fulfillment at the above address; the price is $18 for 12 monthly issues mailed to a U.S. address, $28 if mailed elsewhere, and must be prepaid.

Volcanic Events

- Mauna Loa (Hawaii): Fissure eruption produces voluminous lava flows from NE rift vents; SO_2-rich tropospheric plume reduces visibilities 7000 km away.
- Kilauea (Hawaii): Phases 16 and 17 include strong fountaining, tephra, and the longest flow of the 1983–1984 eruption.
- Mt. St. Helens (Washington): New lobe extruded onto the composite lava dome.
- Veniaminof (Alaska): Vapor plumes and incandescence.
- Pavlof (Alaska): Vapor plume to 6 km altitude.
- Nyamuragira (Zaire): Large lava flows and tephra ejection from flank fissure.
- Campi Flegrei (Italy): More vigorous seismicity; uplift continues.
- Fernandina (Galápagos Is.): Caldera eruption; lava flow; SO_2 plume detected.
- Arenal (Costa Rica): 43rd—40th lava flows since 1968.
- Poás (Costa Rica): Fumarole temperatures decrease.
- El Chichón (Mexico): Plumes on satellite images not caused by eruptions.
- Suwanosejima (Ryukyu Is.): Summary of activity, November 1982-January 1984.
- Submarine Volcanoes (Volcano Is.): 1892–1983 observations.
- Sakurajima (Japan): Tephra causes minor damage.
- Rabaul (New Britain): Seismicity continues to

News (*cont. on p. 339*)

The Oceanography Report

The Oceanography Report
The local point for physical, chemical, geological, and biological oceanographers.

Editor: Arnold L. Gordon, Lamont-Doherty Geological Observatory, Palisades, NY 10964 (telephone 914-359-2900, ext. 325).

Information Report

Symposia on Chemical Oceanography

A continuing concern of the National Science Foundation (NSF), the Office of Naval Research (ONR), and the National Oceanic and Atmospheric Administration (NOAA) is the effective utilization of young scientists. To this end, these agencies are interested in becoming more familiar with the ideas being formulated by these individuals as they enter the field of oceanography and independently pursue their research interests. It is also felt important that these new graduates be in possession not only of the most recent information on the research climate and opportunities in their respective fields, but are provided an insight into the structure, missions, and modes of operation of the cosponsoring agencies of the symposia, as well as the procedures to follow in seeking support to conduct research from these agencies. As a result, the Marine Chemistry Program of NSF and the Chemical Oceanography Program of ONR were extremely receptive to a suggestion made in October 1976 by E. D. Goldberg of the Scripps Institution of Oceanography that it would be useful to have a symposium convened which would be completely dedicated to soon-to-be or recent Ph.D. graduates in chemical oceanography. After discussions at some considerable length with members of the scientific community, preparations were set in motion for convening such a meeting, which was anticipated to be the first in a series.

Owing to the fact that the symposia were created for and are completely dedicated to the newest Ph.D.'s in chemical oceanography, certain general guidelines were formulated. First, major professors of the participants and their departmental heads and deans would not be invited to attend the meeting. The reason for this was that we did not wish to run the risk of creating any barrier to open and frank discussions of papers being presented or to risk achieving the goals of the meeting by its being taken over by these individuals. Second, participation was limited to ensure that each participant had ample time to present his or her thesis research and that sufficient time was available for in-depth discussion and debate. Third, application to and selection for the meeting would be made on the basis of an extended abstract. These abstracts are to be printed in final form approximately 1 month after the close of the symposium, providing an opportunity for the authors to make any revisions as a consequence of the discussions that took place during the meeting. These abstracts are available from the cosponsoring agencies. Finally, time would be made available to the participants not only to initiate and hold informal sessions, but also to address certain topics raised by the agencies at the opening session. The results of these informal sessions would be presented by spokespersons of the groups formed to address the assignments.

It was felt that by bringing together, in scientific discussion and interaction, late stage chemical oceanography doctoral candidates, as well as new Ph.D.'s, professional relationships would be forged which would facilitate future interdisciplinary and interinstitutional investigations. It was also considered that the entire oceanographic community would become better aware of innovations in marine chemistry as a consequence of making young workers' efforts more visible. On the basis of the various types of data from the respective programs involved, these objectives have been realized, and it may well prove to be rewarding to consider having similar symposia convened in the other subdisciplines comprising the Ocean Sciences.

The first Dissertations Symposium on Chemical Oceanography (DISCO) was convened in February 1978, jointly supported by NSF and ONR. Subsequent to the first meeting, NOAA joined in cosponsoring the symposia, which have been convened at approximately 18 month intervals, with coordination being provided in all instances by the American Institute of Biological Sciences (AIBS).

The fifth symposium was recently completed on March 9, 1984, and, again, was a complete success as viewed from both participants and sponsors who attended. With the conclusion of this latest meeting, a total of 139 young marine scientists representing 27 U.S. institutions have had the advantage of participating in, and receiving the benefits of, these symposia. In discussing the desirability of continuing these meetings with the community at large, which obviously included former participants, the present enthusiasm is greater than at the beginning in 1978, and it is clear that these meetings are a community service.

During the period of these symposia, we have benefited from having 10 foreign participants, representing five countries (Belgium, France, Japan, Norway, and Pakistan). Travel for these participants has been provided by both their national resources and the Intergovernmental Oceanographic Commission (IOC) of UNESCO. Recently, the International Association for the Physical Sciences of the Ocean (IAPSO) has indicated that as an international scientific body they would be pleased to become associated with these meetings, and efforts have been initiated to obtain resources from an international organization to support foreign participation, in addition to the national resources noted above. Indeed, it would seem that this series of symposia is proving to be of value well beyond that initially envisaged.

The sixth DISCO is now being planned and is anticipated to be convened from October 14 to 18, 1985. To be an invited speaker at the symposium, the applicant should have received his or her doctorate from an accredited university after October 1984 or, alternatively, his or her departmental chairperson or college dean must certify on the application form that in all probability the applicant will receive his or her degree before July 31, 1986. The applicant's thesis must deal with an important problem in chemical oceanography.

Potential participants are urged to note the dates of this meeting and be alert to a further announcement which will appear in the scientific literature and the posting of information concerning obtaining applications, which will be given wide distribution to appropriate graduate schools.

This Information Report was contributed by Neil R. Andersen, *National Science Foundation, Washington, D.C. 20550, and* Frank L. Herr, *Office of Naval Research, Washington, D.C. 20350.*

News & Announcements

Research Ship Plans for 1985–1987

The University National Oceanographic Laboratory System (UNOLS), representing operators of American academic research ships, has established a National Expeditionary Planning Committee to coordinate planning of research ship cruises to remote areas, multi-ship operations, and operations requiring fixed schedules of work. One essential part of this is to provide predictions of the areas in which the major research ships are likely to operate to make it possible for scientific investigators to do their own planning. This is, of course, a circular process: Some marine scientists have told us of their plans; these have resulted in tentative schedules. We hope that other investigators will fit their plans into these schedules to use the ships more efficiently and to avoid unproductive transit time.

In the following list, ships are listed as working in their "normal operating area," areas close (to home port if there are not present plans for them to work elsewhere. Generalized routes are given for those ships for which there are plans for remote operations. All plans are of course subject to change. Scientific investigators interested in working on any of these ships should contact the ship-operating institution or the UNOLS office (William D. Barbee, UNOLS Office WB-15, School of Oceanography, University of Washington, Seattle, WA 98195).

R/V *Knorr* (Woods Hole): Normal operating area (north and equatorial Atlantic) during summers of 1985 and 1986. Work in far south Atlantic during winter of 1985–1986; may return north either through the Atlantic or the western Indian Ocean and Mediterranean. Time available for work en route in 1985 and 1986.

R/V *Melville* (Scripps): Normal operating area (northeast and central Pacific) 1985 through November and summer of 1986. Possible meridional transects to and from Antarctic along 100° and 170° west in early 1986. Work in southern ocean (Atlantic and Pacific) in winter of 1986–1987, with transit runs either through eastern Pacific or south Atlantic.

R/V *Atlantis II* (Woods Hole): Northeast Pacific in early 1985. *Atlantis II* will carry the DSRV *Alvin* through 1985; its schedule is therefore tied to the *Alvin* schedule, which is not yet firm beyond the end of 1984. *Atlantis II* will be equipped with a SeaBeam system during 1985.

R/V *Conrad* (Lamont): Will work in the equatorial Atlantic and Caribbean in early 1985, followed by East Pacific Rise work into San Diego by June. Transit to the western Pacific (Philippines, South China Sea) and Indian Ocean (north Australia) will be followed by availability in Indian Ocean or southern Indian-Atlantic ocean in late 1985 and early 1986. A tentative schedule for further work in the Indian Ocean during mid-1986 will await proposals. *Conrad* is principally outfitted for marine geophysical programs, with SeaBeam and multichannel seismic system.

R/V *Thomas Washington* (Scripps): Starts 1985 in the south Atlantic; returns to eastern equatorial Pacific in May 1985. In fall-winter 1985 will probably make a loop via Hawaii to the southwest Pacific, to southeast Pacific. May return north in early 1986 through southeast Pacific for north Pacific operations. Will return south to Antarctic for the winter of 1986–1987. Equipped with SeaBeam; will carry two-channel digital seismic system for most of time.

R/V *Thomas Thompson* (University of Washington): Normal operating area (north Pacific north of about 25° north). Will work to Japan and back in 1985, has time available in the northwest Pacific.

R/V *Moana Wave* (Hawaii): Will start 1985 off the coast of Peru, work off western South America in early 1985, transit via Easter Island across the South Pacific to the Fiji area in mid-1985. Will work in the western and southwestern Pacific through October and then proceed to the South Atlantic via either western South America or the Indian Ocean in November or December. Early 1986 will be spent in the southern oceans and a return to Honolulu via the Indian Ocean and southwest Pacific is planned for the summer and fall of 1986. *Moana Wave* is being lengthened in 1984 and will carry a multichannel digital seismic system and SeaMARC II in addition to general laboratory areas and deep sea trawl and hydrographic winches.

R/V *Oceanus* (Woods Hole): Normal operating area (North Atlantic).

R/V *Endeavor* (University of Rhode Island): Normal operating area (North Atlantic). In 1985 will work between Equator and Iceland. In 1986 may work part of year in southeast Pacific.

R/V *Columbus Iselin* (University of Miami): Normal operating area (western North Atlantic, Gulf, and Caribbean).

R/V *Gyre* (Texas A&M): Normal operating area (western North Atlantic, Gulf, and Caribbean).

R/V *New Horizon* (Scripps): Normal operating area (eastern north Pacific, California to Mexico).

R/V *Wecoma* (Oregon State University): Normal operating area (northwest coast of United States). Will work south to Peru and back in March-April 1985.

This news item was contributed by George Shor, Jr., *Chairman, UNOLS National Expeditionary Planning Committee, University of California, San Diego, Scripps Institution of Oceanography, La Jolla, CA 92093.*

Symposium on Vertical Motion

A Symposium on Vertical Motion in the Equatorial Upper Ocean and Its Effects Upon Living Resources and the Atmosphere is to be held May 6–10, 1986, in Paris, France. This multidisciplinary international symposium will address vertical motion in the equatorial upper ocean by bringing together leading researchers in oceanography, meteorology, and fisheries. Papers are invited within the following topics: (1) generation, maintenance, and dissipation mechanisms of vertical motion; (2) relationship between changes in vertical motion and upper ocean heat content, sea surface temperature, and atmospheric planetary boundary layer variations; (3) instrumentation, observational techniques, and data analysis methods; (4) relationship between vertical motion and nutrient enrichment, biological productivity, and fisheries yield; (5) coastal upwelling in low-latitude regions; (6) the role of vertical motion in the 1982–1983 El Niño Southern Oscillation event; and (7) the relationship between vertical motion and the distribution of chemical properties.

This symposium is organized by the Scientific Committee on Oceanic Research (SCOR) Working Group 56 and is cosponsored by the Intergovernmental Oceanographic Commission (IOC), SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO), and Division of Marine Sciences of the UN Educational, Scientific, and Cultural Organization (UNESCO). Members of the Symposium Organizing Committee are D. Halpern (Chairman), United States; R. Barber, United States; O. Guillen, Peru; D. Ho, People's Republic of China; R. Jimenez, Ecuador; A. Longhurst, Canada; H. Rotschi, Ivory Coast; and B. Voituriez, France. The language of the Symposium will be English.

Circular Number 1 was issued in March 1984, in which abstract, registration, and general information about the symposium is provided, can be obtained by writing to David Halpern, NOAA PMEL, 7600 Sand Point Way NE, Seattle, WA 98115.

The Pacific and Its Influence

A specially equipped scientific research ship and an Orion P-3 instrumented aircraft will be dispatched to the equatorial Pacific Ocean this spring by the National Oceanic and Atmospheric Administration (NOAA) to conduct in-tandem studies of the ocean's influence on, and relationship with, the atmosphere. The NOAA ship *Researcher* will cruise the waters from Honolulu to Tahiti between May 14 and June 4, taking water and air measurements while the Orion aircraft samples the atmosphere overhead. After 3 weeks of data collection, scientists hope to gain new knowledge about how the ocean is involved in such phenomena as acid rain, El Niño, and the "greenhouse" buildup of carbon dioxide.

The project will support a series of five interlocking scientific experiments. To try and answer the question of why rain acidity is often as high in the remote ocean as it is in some coastal areas, one of these experiments will investigate concentrations of sulfur and other chemicals in the water column and at the atmosphere's boundary with the ocean. Another experiment deals with carbon dioxide and how it is transferred at the air-sea interface, a step in trying to understand the global "greenhouse" effect that is believed to be warming up the earth's climate.

Two more studies will gather data on trade winds in the equatorial zone and on the turbulent updrafts and downdrafts that transfer heat across the air-water boundary. The fifth experiment is an investigation of the thermocline boundary layer that separates cold, oxygen-poor waters from the warmer waters above them.

These last two investigations will also feed data into NOAA's multi-year EPOCS (Equatorial Pacific Ocean Climate Studies) program, a broad effort by climatologists to understand the variation of sea surface temperatures in the tropical Pacific from season to season and from year to year. The hope is that this program will shed new light on global climate patterns and how they are occasionally disrupted by events such as last year's El Niño.

News (cont. from p. 337)

intensify; deeper, stronger earthquakes; 2 seismic crises.
Manam (Bismarck Sea): Strombolian jets, glowing avalanches, scoria flows.
Langila (New Britain): Activity low; explosions at middle and end of month.
Ulawun (New Britain): Explosions and January seismic crisis 3-month summary.
Bagana (Solomon Is.): Sounds, glow, tephra emissions; but no new lava flows.
Atmospheric Effects: Aerosols persist at mid-latitudes; sunset reports.

Mauna Loa Volcano, *Hawaii (19.47°N, 155.61°W). All times are local (= UT—10 hours).*

The following text (except for the plume data) is from the USGS Hawaiian Volcano Observatory. Times noted below are preliminary and subject to slight revision after later analysis. The USGS will provide a more detailed report of the eruption for a future issue of Eos.

A flank eruption began on March 25 and had ended by April 15. Simultaneous eruptions on March 30 at Mauna Loa, Kilauea, Mt. St. Helens, and Veniaminof make this the first date known on which four U.S. volcanoes were erupting at the same time.

Summit inflation had continued since Mauna Loa's last eruption July 5–6, 1975. Based on an increase in the rate of geodetic change and seismic activity, Decker et al. (*Eos*, September 13, 1983) called attention to the "increased probability of a Mauna Loa eruption within the next 2 years."

There was almost no short-term instrumental warning of the eruption. Seismic activity had been increasing gradually through March, but only 29 microearthquakes were recorded beneath the summit caldera in the 24 hours before the eruption (in contrast to 700 microearthquakes per day in September 1983). At 2255 on March 24, a small earthquake swarm began directly beneath the summit and weak harmonic tremor was recorded from the summit station at 2330. Tremor amplitude and the number of earthquakes increased about midnight, and borehole tiltmeters recorded the onset of rapid summit inflation at 0100.

A military satellite detected a "strong" infrared signal from the summit at 0125, and glow was sighted from the ground 4 min later. Lava fountaining began in the caldera and upper southwest rift, but eruption fissures had migrated down the northeast rift before dawn. All dikes were emplaced within the first 15 hours of the eruption, at propagation rates that varied from 2500 m/hour down the SW rift zone to about 1200 m/hour in lower parts of the NE rift zone (Figure 1).

By March 26 all lava production was concentrated along a 500-m fissure segment near 2900 m altitude, about 15 km NE of the summit area (Figure 2). Approximately 80% of the lava production fed flow 1, which moved rapidly northeast toward Hilo March 27–28 (Figure 3). Significant advance of the front of flow 1 stopped by early March 29, more than 7 km from the nearest homes, although production at the vents remained essentially constant. When weather cleared March 30, a new branch flow (1A) was advancing quickly N of flow 1, but it slowed the next day as it thickened and widened upstream and the feeding channel became sluggish. Slow advance continued until April 5, when a major overflow at about 2000 m altitude shut off most of its lava supply and fed a fast-moving flow (1B). Lava production decreased by about 50% during the nights of April 8–9 and subsequent activity fed flows that did not move far downslope. The rate of outflow gradually decreased and the eruption had ended by early April 15.

The eruption produced a large gas plume that was carried thousands of kilometers to the W by trade winds. There was no evidence that the plume reached the stratosphere. By March 30, a haze layer was detected at Wake and Johnston Islands (1400 and 3900 km from Mauna Loa) and had reached Guam (6300 km to the WSW) by April 2. SO_2 emitted by Mauna Loa was detected by the TOMS instrument on the Nimbus 7 polar orbiting satellite, which passed over Hawaii daily at about local noon. From the TOMS data, preliminary estimates of the total SO_2 in the Mauna Loa plume were roughly 150,000 metric tons on March 26 and 190,000 tons on March 27.

The 1984 basalt was very fine-grained with widely scattered (<<1%) phenocrysts of olivine (most Fo 88–90) and sparse microphenocrysts of plagioclase and clinopyroxene. Maximum temperatures determined repeatedly by thermocouple and radiometer ranged from 1137°–1141°C.

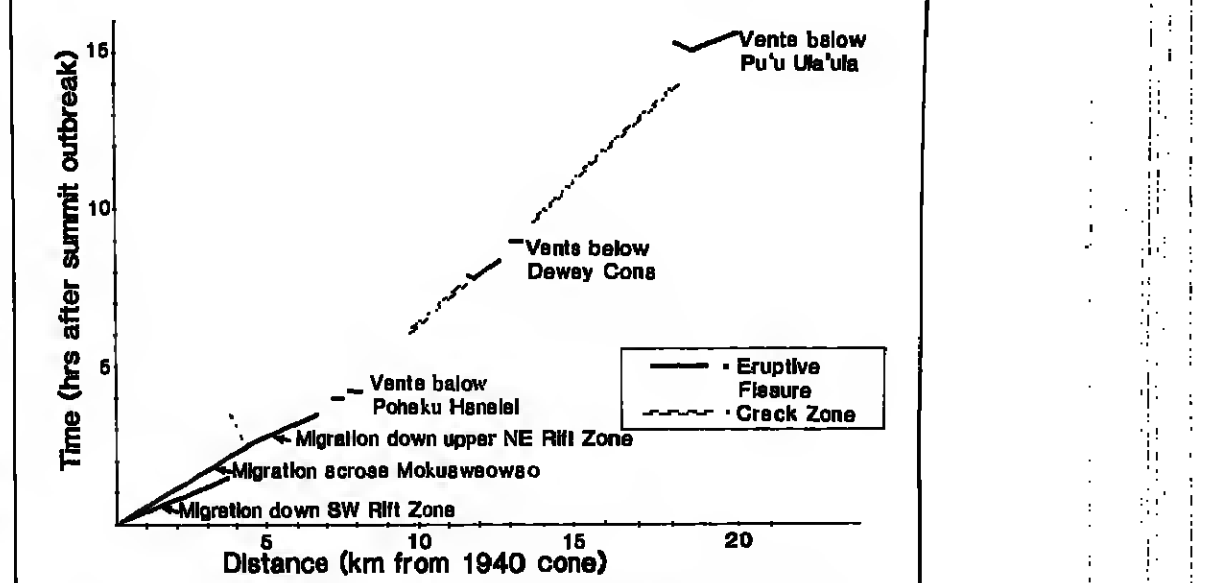

Fig. 1. Rate of propagation of eruption fissures, shown as distance from the 1940 cone (in the SW part of the summit caldera; see Figure 2) versus time in hours after the start of the eruption.

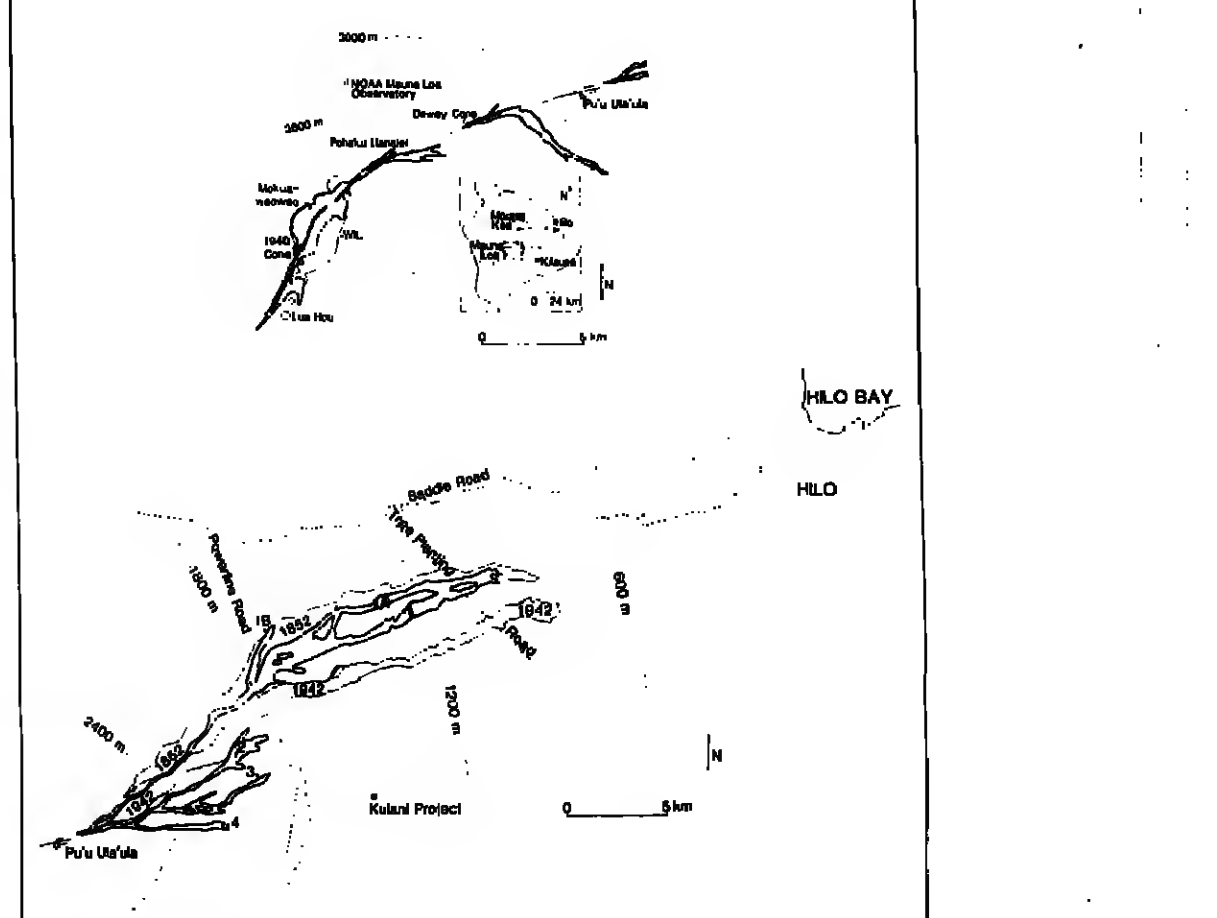

Fig. 2. Maps of the summit area and northeast rift zone of Mauna Loa. Eruption fissures are indicated by hachured lines and 1984 lava flows are stippled. Contours are approximately 600 m apart. The edge of the suburbs of Hilo is shown by a dotted line.

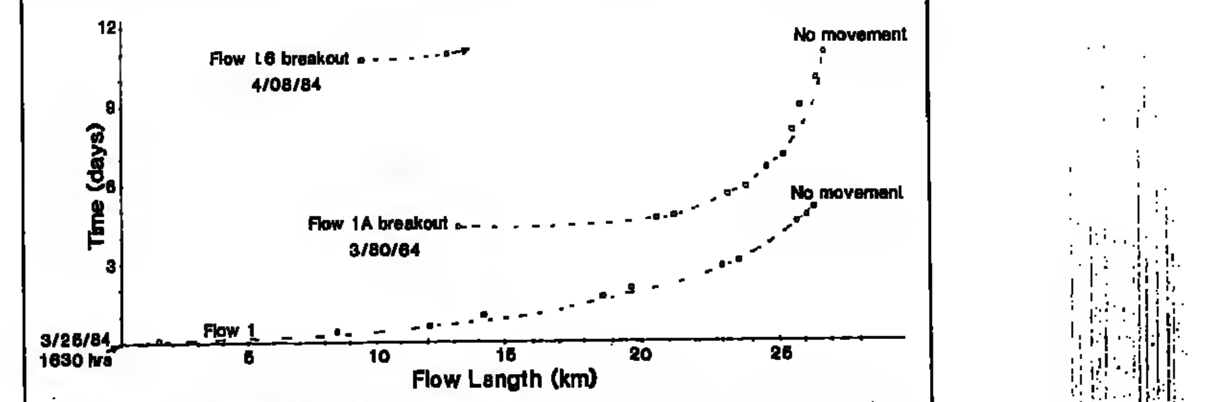

Fig. 3. Rate of movement of flows 1, 1A, and 1B, in kilometers per day. Small circles represent observations of flow positions.

EOS

Transactions, American Geophysical Union

The Weekly Newspaper of Geophysics

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Cover. Magnetic reconnection is a process, important in systems of magnetized plasmas, by which differently directed field lines link up, allowing topological changes of the magnetic field to occur, determining patterns of plasma flow, and resulting in conversion of magnetic energy to kinetic and thermal energy of the plasma. The cover figure demonstrates quite similar consequences of magnetic reconnection that are found in the vastly different environments of a comet, earth's magnetosphere, and a laboratory fusion experiment. (Top) Yerkes Observatory photographs of Comet Morehouse before and after its plasma tail was severed by magnetic reconnection near the comet's head in what is called a "disconnection event" (DE). A comet's plasma tail is created by an accumulation of solar wind magnetic field lines that drape around the comet's head. In a DE, the solar wind plasma and energy that have been stored gradually in the tail during its generation are suddenly released and returned to the solar wind. (Middle) The plasma sheet (shaded) in the tail of earth's magnetosphere is suddenly severed near the earth by magnetic reconnection. This creates a plasmoid (a system of closed magnetic loops) that flows rapidly away through the tail, carrying a vast amount of plasma and energy earlier acquired from the solar wind. Such episodes of plasmoid generation and release to the solar wind were dramatically confirmed by ISEE 3 satellite observations at 1.4 million kilometers from earth and are thought to be the underlying physical process in magnetospheric substorms. (Bottom) Axial cross section of the field-reversed θ-pinch experiment, FRX-C/T at the Los Alamos National Laboratory, showing translation of a field reversed configuration (FRC) from the left section of the cylindrical container, where it was formed, into the "drift tube" section at right. The FRC (shaded), a cylindrical plasmoid, was formed near $Z = 0$ m by magnetic reconnection when an initial B_z (axial) field was entrapped in plasma and then compressed, at $t = 0$ μs, by a fast-rising B_z field of opposite sign (by courtesy of D. J. Rej, Los Alamos National Laboratory). In the middle and bottom panels the lines with black arrows are magnetic field lines and white arrows indicate the direction of plasma flow. (Further discussion of these phenomena can be found in *Magnetic Reconnection in Space and Laboratory Plasmas, Geophysics Monograph Series*, vol. 30, members $23.10, nonmembers $33.00, published by the American Geophysical Union.) (See Hones article this issue.)

Phase 17 of Kilauea's east rift zone eruption began March 30 but had no apparent effect on Mauna Loa activity. Likewise, Kilauea tilt showed no deflection as the Mauna Loa eruption began March 25.

Information Contacts: J. Lockwood and staff, USGS Hawaiian Volcano Observatory, Hawaii Volcanoes National Park, HI 96718; J. M. Rhodes, Dept. of Geology, University of Massachusetts, Amherst, MA 01003; Michael Garcia, Dept. of Geology and Geophysics, University of Hawaii, Honolulu, HI 96822; Tom Casadevall, USGS Cascades Volcano Observatory, 5400 MacArthur Blvd., Vancouver, WA 98661; Arlin Krueger, Code 963, NASA Goddard Space Flight Center, Greenbelt, MD 20771; Michael Matson, NOAA/NESDIS, Room 510 World Weather Bldg., Washington, DC 20233.

Fernandina Caldera, *Galápagos Islands (0.37°S, 91.55°W). All times are local (= UT—6 hours).*

At 0500 on March 30, Oswaldo Chapi and Fausto Cepeda (of the Galápagos National Park) heard noise from Fernandina Caldera, 22 km SW of their position at Tagus Cove. Glow was visible over the NW end of the caldera, and a cloud was seen issuing from the same location after sunrise. The eruption was described as being smaller than the Volcán Wolf eruption of 1982 (see *SEAN Bulletin*, vol. 7, no. 8).

The TOMS instrument in the Nimbus 7 polar orbiting satellite detected SO_2 produced by the eruption April 1 and 2. No data were available March 30–31, and SO_2 had dropped below the detection threshold by April 3. Strongest values on April 1 were directly over the volcano, and a preliminary estimate of total SO_2 was 60,000 metric tons. No eruption cloud was evident on NOAA weather satellite imagery.

On the afternoon of April 4, the cruise ship *Santa Cruz* reported a long plume of vapor coming from the caldera, but apparently decreasing in size. They looked for glow over the volcano that night but reported none.

On April 11, Fernandina was climbed from the NW by David Day and L. Peterson, who reported an apparently inactive lava flow

News (cont. on p. 340)

News *(cont. from p. 339)*

reaching from the western side of the caldera (near the site of the major eruption of 1968) to the lake. At 0650 the next morning, Day and Peterson heard a noise "like a large landslide" from their camp near the western caldera rim. Within 30 s, they reached the rim in time to see what Day described as a nuée ardente that had already moved from the vent area halfway to the lake. They left the rim, and observers from Punta Espinoza, 17 km to the NE, described an eruptive cloud rising at 0655 to an estimated height of about 7 km. At 0704, Day and Peterson were overtaken by an ash rain described as "raindrops with ash," and total darkness persisted until 0720. A thickness of 3 mm of tephra accumulated during that period at their rim camp. By 0725 it was clear enough to see into the caldera. Tephra covered the new lava on the caldera floor with the exception of an area a few hundred meters across in which molten lava could be seen. Day and Peterson left the rim at 1030, and no further volcanism had been witnessed at the time of their radio report, at 1500 on April 13, from Punta Espinoza.

This is the sixth known eruption of Fernandina since the major explosive eruption and massive caldera collapse of 1968. The last eruption was not recognized in the Galápagos, but its products are visible in an aerial photograph taken March 26, 1982. From a 900-m-long circumferential fissure on the S rim of the caldera, flows moved both inward (N) down the caldera wall and over a high topographic bench, and outward (S) where the flow ponded behind another row of circumferential vents. The eruption had not yet taken place when Tom Simkin and others passed this area on December 4, 1980.

Information Contacts: Gunther Reck, Director, Charles Darwin Research Station, Isla Santa Cruz, Galápagos Islands, Ecuador; Lucho Maldonado, Metropolitan Touring, P.O. Box 2542, Avenida Amazonas 239, Quito, Ecuador; David Day, Isla Santa Cruz, Galápagos Islands, Ecuador; Arlin Krueger, Code 963, NASA Goddard Space Flight Center, Greenbelt, MD 20771; Michael Matson, NOAA/NESDIS, Room 510, World Weather Bldg, Washington, DC 20233.

Earthquakes

Date	Time, UT	Magnitude	Latitude	Longitude	Depth of Focus	Region
March 5	0334	6.7 m_b	8.14°N	123.77°E	651 km	Mindanao, Philippines
March 6	0217	6.5 m_b	29.36°N	138.87°E	457 km	S of Honshu, Japan
March 19	2029	7.0 M_S	40.28°N	63.34°E	30 km	Central Turkmen SSR
March 24	0944	7.0 M_S	44.10°N	148.21°E	shallow	S Kuril Islands
March 27	2007	6.3 M_S	4.58°S	145.79°E	12 km	Papua New Guinea

Information Contact: National Earthquake Information Service, U.S. Geological Survey, Stop 967, Denver Federal Center, Box 25046, Denver, CO 80225.

Meteoritic Events

Fireballs: Czechoslovakia; Italy; Portugal; Alaska, Hawaii, Oregon, Pennsylvania, Tennessee, Washington, SE USA.

Books

Magnetic Reconnection in Space and Laboratory Plasmas

E. W. Hones, Jr.
Los Alamos National Laboratory, Los Alamos, NM 87545

AGU is publishing *Magnetic Reconnection in Space and Laboratory Plasmas*, as volume 30 of the *Geophysical Monograph Series* (members $23.10; nonmembers $33.00). This volume is based on the Chapman Conference on Magnetic Reconnection, which was held at the Los Alamos National Laboratory in October 1983. Organization of that conference was first considered in early 1981, at a time when the body of evidence for the occurrence and importance of magnetic reconnection in earth's magnetosphere had already become impressive and was continuing to increase rapidly. There had not been a major conference on the subject since 1977, and the intervening years had seen important new strides being made. Initial plans called for holding the conference in October 1982, but conflicts with other conferences forced its postponement for 1 year. The 1-year postponement turned out to be a blessing in disguise because it permitted major new magnetospheric observations, made during that year by the ISEE 3 satellite, to be reported at the conference.

ISEE 3 was launched in 1978 into a halo orbit around the sunward Lagrangian point where for the next 4 years it served as a solar wind monitor. In late 1982 it was transferred to earth orbit where, by means of lunar gravity assist maneuvers, it executed several trajectories through the far magnetotail reaching down-tail distances as great as 220 R_E (1.4×10^6 km), about 3 times farther than systematic observations of the magnetotail had ever been made before (see *Eos, 64,* 929, 1983). Data returned from that distant tail location contained compelling new indications of the important role of magnetic reconnection in the magnetosphere. One of the most remarkable of these was the observation of large plasmoids (plasma structures threaded with closed magnetic field loops) moving very rapidly down the tail past the satellite in association with magnetospheric substorms. The plasmoids are thought to be sections of the magnetotail plasma sheet that have been severed by magnetic reconnection occurring near the earth. That plasmoids are created and released during substorms had been inferred previously from satellite data acquired much closer to earth, so their actual observation with ISEE 3 constituted a most dramatic confirmation of that earlier idea. This phenomenon is depicted on the cover of this issue of *Eos* along with illustrations of analogous effects of magnetic reconnection that are seen in comets and that are produced in laboratory fusion experiments. The identification of the passing plasmoids was made in ISEE 3 measurements of magnetic fields, energetic particles, and plasma. These and other ISEE 3 observations were reported for the first time at the conference and are published in the monograph.

CONTENTS

This monograph is, I believe, the first book dedicated entirely to the subject of magnetic reconnection and thus should satisfy the present need for a convenient and thorough source of information and references. There is good balance between review papers, papers presenting the basic principles of magnetic reconnection, and papers describing recent observational and theoretical advances. Although the book is weighted toward space plasma interests (e.g., planetary magnetospheres, comets, solar flares) there are also treatments of reconnection in laboratory plasmas, particularly in fusion research devices where a quite different view (in the words of V. M. Vasyliunas, "a snue view") of magnetic reconnection has traditionally been taken.

About a dozen of the papers presented at the conference had been, or were soon to be, submitted to journals for publication. To ensure completeness of coverage of the conference subjects, extended abstracts of those papers, provided by the authors, have been included in the monograph. Two other features of the book will, I think, heighten reader interest. First, questions and answers recorded after the talks are included in the text. Second, the final half-day summary and appraisal session of the conference was tape-recorded, and its transcript (with a minimum of necessary modification) is included as the last section of the book.

Finally, I am pleased that the book will serve to introduce to many of its readers the man who could appropriately be called the father of magnetic reconnection, the Australian physicist, Ronald G. Giovanelli. He was well known in the solar research community, but I feel that he probably was not known generally among magnetospheric and laboratory plasma physicists. Ron Giovanelli suggested the importance of magnetic neutral points in three pioneering papers in 1946, 1947, and 1948 in which he advanced a new theory of solar flares. The subsequent development of the concept of magnetic reconnection evolved from those works. He was invited to speak at the Los Alamos conference but could not attend because of a prolonged severe illness. Instead, he graciously sent me a video tape on which he presented the talk he had wanted to deliver in person. The tape was played for the conference participants, and the talk is included in the monograph. Unfortunately, Ronald Giovanelli finally succumbed to his long illness in January 1984.

Edward W. Hones, Jr., received his Ph.D. in physics from Duke University in 1952. After working 7 years in nuclear reactor physics at the Argonne National Laboratory and the Savannah River Plant he became interested in space research, which he pursued at the Convair Corporation in San Diego, the Institute for Defense Analyses in Washington, D.C., the University of Iowa, and, since 1965, at the Los Alamos National Laboratory. His primary space research interest has been the physics of the earth's magnetosphere. Using data from particle and plasma instruments developed by Los Alamos scientists for the Vela satellites and NASA's IMP 6, 7, and 8 satellites he did pioneering studies relating geomagnetic and auroral activity to the magnetosphere's dynamical behavior in the flowing solar wind. Those studies contributed importantly to the evolution of the present solar wind-magnetosphere interaction theory in which magnetic reconnection is a fundamental process. His magnetospheric studies continue through collaborations with several scientific institutions, most recently using improved observations with NASA's ISEE 1, 2, and 3 satellites.

New Publications

Items listed in New Publications can be ordered directly from the publisher; they are not available through AGU.

Developments in Soil Mechanics and Foundation Engineering, 1, Model Studies, P. K. Banerjee and R. Butterfield (Eds.), Applied Science, New York, xii + 266 pp., 1984, $59.25.

Dictionary of Petrology, S. I. Tomkeieff; E. K. Walton, B. A. O. Randall, M. H. Battey, O. Tomkeieff (Eds.), John Wiley, 680 pp., 1983, $100.

English-Russian Dictionary of Applied Geophysics, B. V. Gusev, N. N. Zefirov, A. S. Petukhov, I. K. Kupalov-Yaropolk, Pergamon, New York, x + 488 pp., 1984, $50.

Explosive Volcanism: Inception, Evolution, and Hazards, Studies in Geophysics, National Academy Press, Washington, D.C., xii + 178 pp., 1984, $24.50.

Global Biogeochemical Sulphur Cycle: Scope 19, M. V. Ivanov and J. R. Freney (Eds.), John Wiley, New York, xiv + 470 pp., 1983, $61.95.

Index of Earth Resources: Observation Systems (poster), compiled by C. S. Southworth, U.S. Geological Survey, Reston, Va., no charge.

Laser Remote Sensing: Fundamentals and Applications, R. M. Measures, John Wiley, New York, xii + 510 pp., 1984, $44.95.

Politics of Mineral Resource Development in Antarctica: Alternative Regimes for the Future, W. E. Westermeyer, Westview, Boulder, Colo., xv + 267 pp., 1984, $22.50.

Proceedings of the Fifth Symposium on Polar Meteorology and Glaciology: Special Issue, No. 29, K. Kusunoki (Ed.), National Institute of Polar Research, Tokyo, v + 227 pp., 1983.

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To be eligible, candidates must have a Ph.D. or equivalent experience in an appropriate technical field. Some appointments may be confirmed prior to August 1984 so early applications are encouraged. All qualified applicants will receive consideration without regard to race, color, religion, sex, or national origin. Application Deadline for September Appointments: August 1, 1984. For further information and application forms contact: SCEEE, 1101 Massachusetts Avenue, St. Cloud, FL 32769 Telephone: (305) 892-6146.

SCEEE supports Equal Opportunity/Affirmative Action.

Postdoctoral Fellow in Atmospheric Science. A position will be available beginning October 1, 1984, at the Harvard-Smithsonian Center for Astrophysics for theoretical analysis of the Shuttle glow and studies of upper atmosphere physics and chemistry. A Ph.D., which involved research in aeronomy, is required. Send applications and names of three references to: A. Dalgarno, Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138.

Positions in Nuclear Waste Disposal Project.(Argonne, Illinois, location) The Project Management Division of Battelle Memorial Institute has immediate openings in its Office of Crystalline Repository Development for a Geohydrologist and a Geostatistician to work on the contract for the development of a high-level nuclear waste repository in deep crystalline rock formation.

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Ocean Drilling Program
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Application deadline is June 1, 1984.

Southwest Research Institute/Ion Mass Spectrometry. A senior staff position is available in the Southwest Research Institute's Department of Space Sciences for a Ph.D. level experimental physicist to work in space-borne ion mass spectrometry. The successful applicant will have the opportunity to develop ion mass spectrometers for spacecraft missions in the earth's magnetosphere as well as to comets and planetary magnetospheres. The position requires significant experience in magnetic ion mass spectrometry and in microchannel-plate imaging detector systems. Contact J.L. Burch, Southwest Research Institute, P.O. Drawer 28510, San Antonio, TX 78284, telephone 512-684-5111, extension 2526, or Bill Crumley, Personnel Department, extension 2072.

Assistant Researcher/University of Hawaii. The Hawaii Institute of Geophysics, Planetary Geosciences Division is accepting applications for one to three positions, full-time, federal funds, to begin between June 1, 1984 and January 31, 1985, for a period of one year, annually renewable pending federal funding. DUTIES: The incumbent(s) will develop and utilize physical remote measurements of planetary surfaces and laboratory measurements of appropriate materials to study the composition, structure, and physical processes operating; and also evolution of planets, satellites, asteroids and comets. Emphasis is to be on optical spectroscopy and surface composition for asteroids, comets, Galilean satellites and terrestrial planets. The incumbent(s) is expected to develop an independent research programs. MINIMUM QUALIFICATIONS: Ph.D. in earth and planetary sciences or a closely related field; experience in acquisition, processing and interpretation of multi-spectral and spectroscopic data; working knowledge of evolution and present state of the planets and of rock-forming minerals (including ices) and their optical properties. DESIRABLE: Experience with electro-optical instrument development and operation, large array computer processing, spacecraft experiments and supervision of technical staff and graduate students. SALARY: Minimum $20,208/annual; maximum $30,360/annual. INQUIRIES: Applicants should send a cover letter describing qualification and experience with their vitae to Dr. Thomas B. McCord, Planetary Geosciences Division, HIG, University of Hawaii, 2525 Correa Road, Honolulu, Hawaii 96822. CLOSING DATE: September 30, 1984.

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The Department of Geography/Geology at Eastern Illinois University is accepting applications for a temporary one year position in geology starting August 25, 1984. Chances are very good that this position will become full-time tenure track. A Ph.D. is required. Rank will be at the assistant professor level. The candidate will be expected to teach physical or historical geology. Preference will be given to those candidates who can teach one or more of the following: an introductory course in geophysics, economic minerals, structure, hydrology, and field geology. Other specialties will definitely be considered. If the position becomes permanent, teaching at summer field camp and the pursuit of research will be expected.

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APPLICATION PROCEDURES:

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(2) Individuals wishing to apply should immediately make their interest known to:

Dr. Gary Wallace, Chairman
Department of Geography and Geology
Eastern Illinois University
Charleston, Illinois 61920
Telephone: office—(217)581-2626; home—(217)345-3772

(3) Candidates should submit the following materials to the above address as soon as possible:

a] Letter of application
b] A current vita
c] Transcripts from all institutions from where college credits have been earned
d] Arrange for three letters of recommendation to be sent. Send names, addresses, and telephone numbers of referees with letter of application.

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Research Planning Institute, Inc.
925 Gervais Street
Columbia, SC 29201

Faculty Position/University of Montana. The Geology Department of the University of Montana is inviting applications to fill a temporary, one-year position at the Assistant Professor level (contract period will be from mid-September 1984 to early June 1985). This position involves replacement of a faculty member on sabbatical leave. Ph.D. in geology is preferred; however, M.A.'s with teaching or professional experience will be considered. Students planning to complete their Doctorate during the 1984–85 academic year are encouraged to apply. Teaching responsibilities include undergraduate courses and introductory geology, mineralogy, petrology (sedimentary), and a seminar in area of special interest.

Those interested should send a letter of application, resume, three letters of recommendation to: Arnold J. Silverman, Chairman, Department of Geology, University of Montana, Missoula, MT 59812. The DEADLINE for applications is May 15, 1984.

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Faculty Position in Geophysics. Texas A&M University has a tenure track assistant professor position open starting in the fall of 1984. This is a new position and we will consider applications from outstanding candidates in any area of solid earth geophysics. Preference, however, will be given in candidates with backgrounds and interests in exploration geophysics, particularly in electrical and magnetic methods. The Department of Geophysics at Texas A&M currently has 17 faculty, 65 graduate students and 100 undergraduate students. The current faculty research emphasis is in the following areas: exploration geophysics, engineering geophysics, tectonophysics, internal earth structure, geodynamics, and general geophysics. Geophysics maintains close contacts with the Ocean Drilling Program and intends to participate actively in the Continental Scientific Drilling Program. The Department has a VAX 11/780 computer and has just moved into a new building.

Applicants should send their resume and the names of three references by June 1, 1984 to E. Hoskins, Department of Geophysics, Texas A&M University, College Station, TX 77843.

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Postdoctoral in Field of Planetary Atmospheres. Start summer '84 for 12-month appointment, probably renewable, $17,500. Preferred research interests: upper atmosphere aeronomy (exosphere), climate modeling, radiative transfer. Send vitae to: Professor J.W. Chamberlain, Space Physics and Astronomy, Rice University, P.O. Box 1892, Houston, TX 77251.

Postdoctoral Research Appointments/UCLA. Applications are invited for several anticipated appointments on the Research staff at the Space Science Group of the Institute of Geophysics and Planetary Physics, University of California, Los Angeles. The successful applicants will be expected to devote a substantial fraction of time to research and project activities in one or more of the following areas: physics of the Jovian magnetosphere including scientific investigations and data system development for the Galileo magnetometer; physics of the terrestrial magnetosphere, including analysis of ISEE and AMPTE data; studies of terrestrial ULF waves emphasizing either ATS-6 data analysis or theory; solar wind-planetary studies including analysis of Pioneer Venus data.

Applicants for these positions should possess the Ph.D. degree in a relevant area of physics, astronomy, or planetary sciences. Some experience with data analysis is desireable but not essential.

A resume, copies of no more than three publications or preprints and the names of three referees should be sent to: Dr. Margaret G. Kivelson, Dr. Robert L. McPherron or Dr. Christopher T. Russell, Institute of Geophysics and Planetary Physics, UCLA, Los Angeles, CA 90024.

The University of California encourages applications from qualified women and minorities.

Assistant Curator/Texas A&M University. Assistant Curator, Ocean Drilling Program, Texas A&M University, to oversee operations of ODP core repositories, including cataloging and maintenance of collection, supervision of personnel, processing of sample requests according to JOIDES/ODP sampling policy, and participation in drilling cruises. Masters or PhD in sedimentology, paleontology, or related area preferred. Send letter of application, resume and names of four referees to:

Dr. Russell Merrill, Curator and Manager of Science Services, Ocean Drilling Program
P.O. Drawer GK
College Station, Texas 77843
Application Deadline is June 1, 1984.

Research Associate in Geochemistry/Petrology.

The Department of Geology, University of Oregon, invites applications for the position of Research Associate. Primary responsibilities will be to organize and obtain funding for independent research in geochemistry and petrology, and to supervise operations of the Department's XRF laboratory. Teaching advanced courses and supervision of graduate students is possible but not obligatory. Applicants must be familiar with modern analytical techniques, especially XRF, and should have a Ph.D. in one of the earth sciences.

Two-thirds of a nine month salary ($13,700) will be assured. The remainder ($6,850), plus summer salary ($4,570) if feasible, will come from research grants or other funds generated by the successful applicant. Resume, together with bibliography and names of at least three references, should be sent to: G.G. Goles, Department of Geology, University of Oregon, Eugene, Oregon 97403, before 15 May.

The University of Oregon is an affirmative action/equal opportunity employer and complies with Section 504 of the Rehabilitation Act of 1973.

University of Wisconsin-Milwaukee Faculty Position in Atmospheric Sciences. The atmospheric sciences program in the Department of Geological and Geophysical Sciences will have a tenure track position supported by state funds at the assistant professor level starting in September 1984. The applicant must have a PhD in meteorology or atmospheric science or a related field. Preference will be given to those who have a good publication record and/or postdoctoral experience. The successful applicant will be expected to develop a strong research and graduate program, and to teach undergraduate meteorology courses starting at freshman level. In the undergraduate major area, he or she will teach courses in advanced dynamics, mesometeorology and mesoscale modeling, in addition to courses related to the field of expertise. Usually two courses (6 credit hours) are assigned per semester.

Research opportunities at UW-Milwaukee include satellite meteorology, severe storm dynamics and energetics, diagnostic modeling, large-scale circulations and energetics, synoptic meteorology and numerical modeling. Research facilities include McIDAS, Great Lakes Research Facility, Urban Research Center, and a rural field station. Interested candidates should forward their resume to: Professor O.N. Sikdar, Chairman, Search Committee, Department of Geological and Geophysical Sciences, UW-Milwaukee, 1900 E. Kenwood Blvd, Milwaukee, WI 53211, with three letters of recommendation from professors and scientists well acquainted with the applicant's education background and research potential. Closing date for applications is 21 May 1984.

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Assistant Professor Position/Theoretical Physics. The Physics Department at the University of Houston expects to fill several tenure track positions in theoretical physics at the assistant professor level. The first of these may be filled in the fall of '84. The areas of interest are Condensed Matter, Nonlinear Dynamics, Plasma Physics (including Space Plasmas) and Statistical Mechanics. Our intention is to emphasize interdisciplinary activity within these broadly defined areas. It is desirable that candidates have an interest in interactions with other members of the theory group and the experimental programs.

Send resumes and three letters of reference to George Reiter, Physics Department, University of Houston, Houston, TX 77004.

The University of Houston is an equal opportunity/affirmative action employer.

Mineralogy/Department of Geology, University of Oregon. A position of Visiting Assistant Professor of Geology will become available on September 15, 1984. The successful candidate should have research interests in the general field of mineralogy and crystallography and will be required to teach the one-year mineralogy course to geology majors. Teaching of one or more courses in specialized areas of mineralogy is encouraged.

Departmental research facilities of interest to a mineralogist include UV-IR spectrophotometers, electron probe, SEM, neutron activation analysis, AA, XRF, XRD, and a high-resolution X-ray emission spectrometer.

Applicants should have a doctoral degree or have substantially completed the requirements for it before taking up the appointment. Send curriculum vitae, bibliography, and statement of research interests, with names of three professional referees by May 15, 1984 to Chairman, Mineralogy Search Committee, Department of Geology, University of Oregon, Eugene, Oregon 97403.

Salary dependent on qualifications.

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University of Arizona/Tandem Accelerator Mass Spectrometry. A position is available for a junior or experienced postdoctoral scientist at the National Science Foundation Facility for Radioisotope Analysis at the University of Arizona. The facility is used primarily to detect and analyze the presence of ^{14}C, ^{10}Be and other rare isotopes in samples of scientific interest, and for research on applications of accelerator mass spectrometry. Half of the time on the Facility is reserved for collaboration with off-site users, and the other half is used for in-house research programs. The person hired for this position will be responsible for physics aspects of the tandem accelerator and associated equipment, and will have the opportunity to develop research programs utilizing the Facility. Salary will be commensurate with experience. Available now. Contact Professor D. J. Donahue, Department of Physics, University of Arizona, Tucson, Arizona 85721 (602-621-2480).

The University of Arizona is an equal opportunity/affirmative action employer.

The Colorado School of Mines. The Department of Geophysics of the Colorado School of Mines expects to have an opening for the academic year 1984–1985 for a candidate with experience in coal geophysics, earthquake seismology or seismic risk. The Department emphasizes geophysical exploration and applied geophysics, and preference will be given to the candidate who can bring that emphasis to his particular field of expertise. An extensive suite of field equipment and computers is available to support research projects, and the Department operates a seismic observatory that is part of the world-wide network. We expect that the appointment will be made at the Assistant Professor level; however, an accomplished scientist with a background in one of the areas of interest could be considered at a higher level. Please send applications, resumes and/or inquiries to: Philip B. Romig, Professor and Head, Department of Geophysics, Colorado School of Mines, Golden, Colorado 80401.

The Colorado School of Mines is an affirmative action/equal opportunity employer.

Laboratory for Atmospheric and Space Physics. The Laboratory for Atmospheric and Space Physics of the University of Colorado invites applications for the position of Research Associate. We anticipate openings in active space research programs in the disciplines of planetary atmospheres (including earth's atmosphere and comets), solar physics and astrophysics. LASP facilities include the operations control and data analysis center for the Solar Mesosphere Explorer; an IUE Regional Data Center; and a complete space instrument design and fabrication facility. LASP also has experiments on Pioneer Venus, Voyager, Galileo and the Upper Atmosphere Research Satellite. In addition, five sounding rocket experiments will be conducted in 1984 and several of these will evolve to shuttle SPARTAN payloads over the next few years. LASP engineering facilities allow the in-house design, fabrication and calibration of state of the art flight hardware and our modern computer facilities are tailored to scientific data analysis and theoretical studies. The Laboratory is an Institute of the University's graduate school and has close ties with the Departments of Astrophysical, Planetary and Atmospheric Sciences and of Aerospace Engineering. A doctorate in a relevant subject is required; salary in accord with experience.

Send letters of application with an updated resume and the names of two references to:

A.I.F. Stewart
University of Colorado
L.A.S.P.
Campus Box 3.10
Boulder, CO 80301

Applications are being accepted on a continuing basis.

The University of Colorado is an affirmative action/equal opportunity employer.

Postdoctoral Position in Upper Atmospheric Physics. A postdoctoral position is available in the Space Physics Research Laboratory at the University of Michigan for a qualified candidate with a Ph.D. degree and experience in Upper Atmospheric Physics. The position involves the analysis of data obtained from two instruments flown on the NASA Dynamics Explorer-2 satellite. The extensive satellite data base provides detailed information of the Dynamics, Thermodynamics and Compositional Structure of the Neutral Upper Atmosphere. The appointment will be for one year (renewable) and is to start in October, 1984. The applicant should identify and describe areas of his or her expertise that can support theoretical investigations in Upper Atmosphere Physics. A resume and the names of three persons knowledgeable of the applicant's experience should be forwarded to:

Dr. T.L. Killeen
Space Physics Research Lab.
Department of Atmospheric and Oceanic Sciences
The University of Michigan
2455 Hayward
Ann Arbor, MI 48109-2143

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STUDENT OPPORTUNITIES

Howard University/Graduate Assistantships in Geosciences. Howard University in Washington, D.C. offers a new graduate program for the M.S. degree in Geoscience, made possible by a grant from the Gulf Oil Company. Areas of specialization are field geology/geophysics, geochemistry, and meteorology/hydrology with remote sensing. Some stipends and assistantships are available. Potential students should write to Dr. Eric Christoffersen, Department of Geology and Geography, Howard University, Wash., D.C. 20059.

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Meetings

Announcements

AAAS Atmospheric and Hydrospheric Sciences

May 24–29, 1984 American Association for the Advancement of Science (AAAS) Annual Meeting, New York, N. Y. (Bernice Ackerman, Secretary, Section W, P.O. Box 5050, Station A, Champaign, IL 61820; tel.: 217-333-1702.)

Section W (Atmospheric and Hydrospheric Sciences) is sponsoring four symposia at the AAAS national meeting. On May 27 will be "El Niño and the Southern Oscillation." The topics on May 28 will be "Agricultural Production in Anomalous Weather Conditions" and "Is the Earth's Biota an Important Contributor to the Increase in CO_2 in the Atmosphere?" The fourth symposium, on May 29, will discuss "The Sources of Radiatively Important Tree Species."

Arctic Science Conference

October 3–5, 1984 1984 Arctic Science Conference (35th Alaska Science Conference), Anchorage, Alaska. Sponsor, AAAS Arctic Division. (John Davies, P.O. Box 80271, Fairbanks, AK 99708; tel.: 907-474-7371.)

Titles of abstracts should be submitted by June 1, 1984.

Abstracts are due July 30, 1984. (Titles and abstracts for the Meteorology and Oceanography Symposium should be sent to Stuart Bigler, National Weather Service, P.O. Box 23, Anchorage, AK 99513; tel.: 907-271-5136.)

Papers are invited on any area of northern science. There will be special sessions during the meeting on Vegetation, Inventory, and Mapping; Pure and Applied Mathematics; and a Special Program for High School Students. There will also be six symposia on the following topics: Science and Public Policy, Telecommunications and Policy, Credibility and Acceptance of Sciences in the North, Earthquake Hazards Reduction, Meteorology and Oceanography of American High Latitudes, and Science Education: Issues and Problems in Alaska, the Yukon, and Northwest Territories.

Watershed Management

April 30–May 1, 1985 Symposium on Watershed Management, Denver, Colo. Sponsor: American Society of Civil Engineers. (E. Bruce Jones, President, Resource Consultants, Inc., P.O. Box Q, Fort Collins, CO 80522.)

The deadline for submitting abstracts is June 10, 1984.

The theme for the meeting will be "Watershed Management in the '80's: New Directions," and papers are solicited on topics relevant to that theme. Suggested areas of concern are environmental impact, land hydrology, modeling and simulation, hydrologic methods and processes, snow management, state-of-the-art appraisals, and watershed management case histories.

Ogallala Aquifer

June 5–6, 1984 Ogallala Symposium II, Lubbock, Tex. Sponsors: Texas Tech University Water Resources Center, International Center for Arid and Semi-Arid Land Studies, High Plains Underground Water Conservation District No. 1, Panhandle Underground Water Conservation District, Oklahoma State Univ. Div. of Agriculture, USGS. (WRC, Texas Tech University, Lubbock, TX 79409; tel.: 806-742-3597.)

The symposium will deal with recent studies of the Ogallala Aquifer, a vast underground water formation underlying portions of eight states, and will also examine advances in groundwater research in general. Among the topics will be hydrologic and geologic characteristics, aquifer recharge, water and contaminant sampling and transport, aquifer augmentation and conservation, modeling, economic factors, and aquifer development and decline. Speakers from the U.S. Departments of Agriculture and Interior, from state agencies, universities, and private engineering and consulting firms are scheduled to present technical papers.

Canadian Hydrology Symposium

June 10–12, 1984 Canadian Hydrology Symposium 1984, Quebec, Canada. Sponsor: National Research Council of Canada Associate Committee on Hydrology. (H. R. Whiteley, School of Engineering, University of Guelph, Guelph, Ontario N1G 2W1, Canada.)

The symposium will deal with the interaction between hydrological processes within watersheds and the substances that determine water quality. The study of substances transported by water, their sources, and the pathways along which they move, will be particularly emphasized. Specific topics scheduled for discussion include: atmospheric inputs and their impact on water quality; land use as a determinant of water quality; contaminants and processes in urban runoff; water quality evolution in rivers, lakes, and reservoirs; overland runoff processes; and the use of deterministic and stochastic hydrological models.

New Listings

June 25–27, 1984 Technology Transfer Society Ninth Annual Meeting and International Symposium, Boston, Mass. (Margaret McNamara or Jack Griffin, Naval Undersea Systems Center, New London, CT 06320; tel.: 203-440-4590 or -4116.)

July 22–28, 1984 Eighth World Conference on Earthquake Engineering, San Francisco. Sponsor: Earthquake Engineering Research Institute. (J. Penzien, Earthquake Engineering Research Institute, 2620 Telegraph Ave., Berkeley, CA 94704; tel.: 415-848-0972.)

August 26–29, 1984 Geothermal Resources Council Annual Meeting, Reno, Nev. (Geothermal Resources Council, P. O. Box 1350, Davis, CA 95617; tel.: 916-758-2360.)

September 28–29, 1984 Tectonic Geomorphology—15th Annual Geomorphology Symposium, Binghamton, N.Y. Organizers, Marie Morisawa and John Hack. (Marie Morisawa, Dept. of Geological Sciences, SUNY, Binghamton, NY 13901; tel.: 607-798-2615.)

October 16–18, 1984 Statistics Symposium on National Energy Issues, Seattle, Wash. (Robert Kinnison, Statistics Section, Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352.)

AGU

AGU Membership Applications

Applications for membership have been received from the following individuals. The letter after the name denotes the proposed primary section affiliation.

Gladees Abdypoor (T), Sampson A. Acheampong (H), M. M. Aral (H), Alan Barnett, Ulrich R. Christensen (T), Herbert A. Cohen (SM), Balaram Dey (A), Augusto Ghetti (H), Thomas W. Giambelluca (H), William C. Keene (A).

Robert W. Lichty (H), Raymond Luebbers (A), Robert B. Lundahl (T), Kazuo Makita (SM), Joel Marko (S), Edward C. Mozley, Hitonori Ono (H), A. M. Sereci (S), Edward H. Tenner, Leon Wittwer (SM), Toshitsugu Yamazaki (GP), Gonzalo A. Yanez Carrizo (GP).

Student Status

G. D. Earle (SM), John Flinn (G), Yousef D. Gumati (T), Jeffrey W. Johnston (T), Thomas J. Kerr (G), Peter T. May (A), Jim E. O'Connor (H), Angelos Protopapae (H), Michael Ravine (P), J. Milo Robinson (G), Raylan H. Roetman (A), Jefferson R. Snider (A), Douglas K. Solomon (H), Harlan E. Spence (SM), David A. Wark (V), Stuart A. Weinstein (S), Carolyn M. Zehnder (S), Yuanchong Zhang (G).

Correction

In the article, "AGU Scholars," which appeared in the March 13, 1984, issue of *Eos* (p. 101), the affiliation given for Charles R. Elerson was listed incorrectly. He is currently enrolled at the University of Wisconsin-Milwaukee.

GAP

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Planetology

6545 Interiors of planets
VENUS BANDED TERRAIN: TECTONIC MODELS FOR BAND FORMATION AND THEIR RELATIONSHIP TO LITHOSPHERIC THERMAL STRUCTURE
Sean C. Solomon (Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Mass. 02139) and James W. Head

Recent radar images of the mountains of Ishtar Terra, Venus, at approximately 3-km radar resolution show a series of linear bands of alternately greater and lesser backscatter; the bands are generally aligned with the topographic strike of the mountain ranges. We test the hypothesis that these band features are tectonic in origin, the product either of folding during lithospheric compression or of block faulting during lithospheric extension. Tested models for folding include uniform elastic and viscous plates [illegible] ... Venus highlands ... tectonics, banded terrain, elastic lithosphere)
J. Geophys. Res., B, Paper 4B0470

Seismology

5920 Explosion Seismology
A COMPARISON OF VELOCITY AND ATTENUATION BETWEEN THE NICOBAR AND BENGAL DEEP SEA FANS
R.S. Jacobson (College of Oceanography, Oregon State University, Corvallis, Oregon 97331), G.G. Shor, Jr., Michel Bee

The compressional wave velocity and attenuation measurements from a deep-source, deep-receiver seismic refraction experiment from the Nicobar Fan, Indian Ocean, are presented and compared to a similar set of measurements in the Bengal Fan. [illegible]
J. Geophys. Res., B, Paper 4B0453

5930 Seismic sources
EFFECTS OF PHYSICAL FAULT PROPERTIES ON FRICTIONAL INSTABILITIES PRODUCED ON SIMULATED FAULTS
P. G. Okubo (Branch of Seismology, U.S. Geological Survey, MS 977, 345 Middlefield Road, Menlo Park, CA 94025) and J. H. Dieterich

Laboratory studies of large-scale simulated faults show that physical properties of the fault, specifically normal stress and fault roughness, significantly influence the unstable shear failure behavior of the fault. [illegible] ... When a length scale based on rupture nucleation dimensions, directly proportional to critical displacements, is introduced, the data suggest that at fault lengths close to the nucleation lengths rupture velocity and slip velocity increase with increasing fault length. (Stick-slip, Frictional instability)
J. Geophys. Res., B, Paper 4B0399

5955 Seismic Sources
MOMENT-MAGNITUDE RELATIONS IN THEORY AND PRACTICE
Thomas C. Hanks (U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025) and David M. Boore
[illegible]
J. Geophys. Res., B, Paper 4B0432

5970 Structure of Crust and Upper Mantle
STRUCTURE AND VARIABILITY OF SEISMIC CRUST ON THE FLANKS OF THE EAST PACIFIC RISE [illegible]
[illegible]
J. Geophys. Res., B, Paper 4B0450

6970 Structure of the Crust and Upper Mantle
GEOLOGIC AND SEISMIC VELOCITY STRUCTURE OF THE CRUST/MANTLE TRANSITION IN THE BAY OF ISLANDS OPHIOLITE COMPLEX
J.A. Karson (Department of Geology and Geophysics, WHOI, Woods Hole, MA 02543), J.A. Collins and J.F. Casey

Geological investigations of the Bay of Islands Ophiolite Complex show that while a typical layered ophiolite suite is present, the thickness of major lithologic units is extremely variable from place to place. [illegible]
J. Geophys. Res., B, Paper 4B0332

Social Sciences

7390 General (Reservoir Management)
A DESCRIPTIVE DECISION PROCESS MODEL FOR HIERARCHICAL MANAGEMENT OF INTERCONNECTED RESERVOIR SYSTEMS
R. Ilter Asighen and Jose Coquenpilu (Department of General Engineering, University of Illinois, Urbana, Illinois, 61801)

A significant limitation of prescriptive optimization models is that their formulation is disassociated from the behavioral and organizational attributes of the problem addressed. In an attempt to alleviate this limitation, a decision process model is formulated directly within a framework of decision agents involved in integrated long- and short-term planning and management of multipurpose and multireservoir system operations. The resulting model is hierarchical, multilevel, multilayer, and decentralized, and as such it is reflective of a reservoir system managed and operated by geographically separated multiple agents having different authorities and responsibilities. Robustness and performance of the model is investigated using the Shasta-Trinity System of California as an example. Results are encouraging for the descriptive as well as prescriptive relevance of the model. (Reservoir management, decision model)
Water Resour. Res., Paper 4W0279